

Interview Pursuant to 37 C. F. R. §1.133

Applicants thank the Examiner for an interview of May 21, 2003. The prior art of record, U. S. Patent Nos. 4,127,594 (Anderson *et al.*); 4,348,509 (Sanders *et al.*); and 5,191,052 (Welborn Jr.), was discussed with Examiner. Examiner proposed to Applicants to possibly amend the claims to recite a particular level of unsaturation not embraced by the commercially available XAD™-4 resin and to possibly amend the claims to recite that the Applicants claimed composition was a porous particulate composition such as was not taught by Welborn Jr. of record. Support for such amendments to claim 1 was discussed with Examiner.

Support for Amendments

Support for the amendment to claim 1 of a porous particulate composition is found at page 3, lines 25-34; at page 7, lines 27-31; at page 8, lines 16-21; and at page 9, lines 1-33. Additional support for the porous particulate composition is found in Examples 1-20 at page 19 to 29.

Response to 35 U.S.C. § 102(b) Rejection of Claims 1,2 and 4-6

Claims 1, 2, and 4-6 stand rejected under 35 U.S.C. 102(b) as anticipated by Anderson, *et al.* (U.S. Pat. No. 4,127,594). The Examiner asserts that Anderson *et al.* disclose a process in which XAD-4 from Rohm and Haas is treated with a rhodium salt to form a supported catalyst. Noting "Illustrative Embodiment II" in column 6 of Anderson *et al.*, the Examiner states:

"Since the rhodium is capable of complexing to olefinic unsaturation (as evidenced by the capability of the material for catalyzing olefin hydrogenation) and since the rhodium becomes

supported, it would reasonably appear that the catalytic component (i.e., the rhodium complex) becomes coordinated to the olefinic groups of the commercially available Rohm and Haas product and therefore the product of patentees reasonably appeared to contain a catalytic component reacted with olefinic groups."

Applicants respectfully traverse the rejection. Anderson *et al.* teaches a process for selectively hydrogenating olefinic impurities present in organic compounds by treating the compounds with hydrogen at temperature between 20° C and 150° C in the presence of a supported hydrogenation catalyst comprising metals selected from rhodium, platinum and palladium deposited on a non-acidic, refractory support (Claim 1). The catalytic support taught is Amberlite XAD™-4, a polystyrene adsorbent resin available from Rohm and Haas Company. The rhodium catalyst in Illustrative Embodiment II cited by Examiner, is rhodium metal deposited on a polystyrene adsorbent resin. No reaction of the metal with the support is disclosed, taught or suggested in Anderson *et al.* In fact a person of ordinary skill in the art would understand the preparation of the catalyst in Anderson *et al.* as chemadsorption of a metal on a support. A water soluble salt, rhodium nitrate, is mixed with a polystyrene adsorbent resin (Amberlite XAD™-4). The solid was reduced in an autoclave under 1750 psi H<sub>2</sub> at 170° C for 2 hours to prepare Rh/XAD™-4. The rhodium salt (Rh<sup>3+</sup>) is reduced to rhodium metal (Rh). There is no reaction of the support with the metal as the Examiner asserts. Any residual olefinic groups of the XAD™-4 support would be hydrogenated in the presence of the rhodium catalyst and the composition would likely contain no free olefin groups. Moreover, rhodium nitrate is an inorganic salt, not an organometallic complex. The composition taught in Anderson *et al.* requires hydrogen to reduce the metal salt to a catalytically active metal. Anderson *et al.* clearly does not teach the elements of

Applicants composition. Applicants respectfully submit that all of the limitations of a claim must be considered in establishing anticipation under 35 U. S. C. §102(b). Applicants respectfully submits the invention as presented in claims 1, 2 and 4-6 is patentable over Anderson *et al.*

Response to 35 U.S.C. § 103(a) Rejection of Claims 1, 2 and 4-6

Claims 1, 2, and 4-6 stand rejected under 35 U.S.C. 103(a) as obvious in the alternative over Anderson, et al. (USP 4,127,594). Applicants respectfully submit that all of the limitations of a claim must be considered in establishing a *prima facie* case of obviousness under 35 U. S. C. §103(a). Anderson *et al.* neither discloses teaches or suggests all limitations of Applicants invention, namely an organometallic catalyst component and the reaction of the catalyst component with an olefin based material having a plurality of free olefin groups. Applicants submits the invention as presented in claims 1, 2 and 4-6 is patentable over Anderson *et al.* of record.

Rejection under 35 U.S.C. § 102(b) over Sanders, et al. (USP 4,348,509)

Claims 1, 2, and 4-6 stand rejected under 35 U.S.C. 102(b) as anticipated by Anderson, *et al.* (USP 4,348,509). The Examiner notes that Sanders *et al.* disclose a composition in which chloroplatinic acid is used to impregnate commercially available Rohm and Haas product XAD-4. The Examiner states:

“Since XAD-4 is known to contain pendant olefinic groups as set out above and since transition metals are known to coordinate to olefinic groups, it reasonably appear that the chloroplatinic acid coordinates to the olefinic unsaturation. Note column 3 lines 30-44 and the Example in which chloroplatinic acid is used to impregnate the Rohm and Haas product.”

Applicants respectfully call Attachment I to the Examiner's attention. Attachment I is a declaration by Eric G. Lundquist, a Research Fellow with Rohm and Haas Company and an inventor on the present patent application. Much of Dr. Lundquist's experience at Rohm and Haas Company has been as a scientist in the department that invented XAD-4 and related macroreticular resins. Applicants will repeat a major portion of that declaration here for purposes of clarification.

In the summary of the in-person interview of May 21, 2003, the Examiner proposed that applicants

"Possibly amend the claims to recite a particular level of unsaturation not embraced by the commercially available XAD-4 etc of the prior art..."

Applicants respectfully call Attachment I to the Examiner's attention. Attachment I is a declaration by Eric G. Lundquist, a Research Fellow with Rohm and Haas Company and an inventor on the present patent application. Much of Dr. Lundquist's experience at Rohm and Haas Company has been as a scientist in the department that invented XAD-4 and related macroreticular resins. Applicants will repeat a major portion of that declaration here for purposes of clarification.

1. AMBERLITE™ XAD-4 is a hydrophobic macroreticular resin having an average pore size of 50 Angstroms. Although AMBERLITE™ XAD-4 does contain a significant level of pendant vinyl groups (residual double bonds from the incomplete cross-linking of divinylbenzene) distributed uniformly within its porous polymer particle, most of these double bonds are inaccessible to solutions of

metallic complexes even when those metallic complexes are dissolved in hydrophobic solvent. This inaccessibility is due to the small average pore size of AMBERLITE™ XAD-4, a barrier that cannot be overcome even by solvent having solubility parameters similar to those of the resin.

2. The matrix resins of the present invention have average pore sizes greater than 100 Angstroms. Such pores are large enough to be efficiently loaded with metallic complexes.
3. Regarding Sander's (USP 4,348,509) Illustrative Embodiment A at column 3, lines 32-42, the method of adding a 30 wt% solution of  $\text{H}_2\text{PtCl}_6$  in water to AMBERLITE™ XAD-4 is entitled "Impregnation", yet it is in reality nothing more than an attempt to coat the exterior surface of the AMBERLITE™ XAD-4 particles. In my experience, hydrophobic macroreticular resins do not imbibe water when that water contains hydrophilic solutes (e.g.,  $\text{H}_2\text{PtCl}_6$ ). This failure to imbibe aqueous solutions of hydrophilic solutes is all the more true for hydrophobic macroreticular resins having very small average pore sizes (i.e., ~ 50 Angstroms). There is no driving force for high-surface-tension, hydrophilic solute-containing aqueous solutions to enter pores having diameters on the order of microns, let alone capillaries having diameters of < 100 Angstroms.

Sanders' process clearly is a process of coating rather than impregnation. In the very words of the Sanders' disclosure, we read:

- a) aqueous solution is "added dropwise to the resin in a porcelain dish";

- b) "a spatula is used to help coat the resin evenly" (emphasis added);
- c) "an air gun is used periodically to remove excess moisture" (emphasis added); and
- d) "catalyst is briefly dried with an air gun until it is free-flowing".

All of this emphasizes again and again that the AMBERLITE™ XAD-4 particles are being coated and that the aqueous solution is failing to penetrate. The act of drying periodically with an air gun is necessary to "remove excess moisture". This removal of excess moisture would only be necessary if the water, and its  $\text{H}_2\text{PtCl}_6$  solute, was not penetrating. Were it penetrating, there would be no excess water to remove.

Tellingly, Sanders reaches for the air gun yet again to remove water "until it (the resin /  $\text{H}_2\text{PtCl}_6$  combination) is free-flowing. It may be strongly and logically inferred from this necessity of evaporating even more water to make the resin free flowing, that water bridging was occurring between particles. (A well known problem for resin handlers.) Water bridging is not usually a handling problem with hard resins like AMBERLITE™ XAD-4 . That enough water bridging between hard particles would still be occurring, even after repeated cycles of air gun drying, indicates clearly that water was not penetrating and, hence, that  $\text{H}_2\text{PtCl}_6$  was not penetrating.

4. The aqueous  $\text{H}_2\text{PtCl}_6$  solution did not penetrate the AMBERLITE™ XAD-4 particles. This being the case, it is fair to ask whether any

significant amount of  $\text{H}_2\text{PtCl}_6$  could have come in contact with double bonds during Sander's preparative procedure. To answer this question, Dr. Lundquist determined the accessible double bonds compared with total double bonds using standard calculation methods practiced in the Ion Exchange Research Department.

For a 500 micron AMBERLITE™ XAD-4 porous polymer bead, the surface area per gram is 750 m<sup>2</sup>/g of which  $1.086 \times 10^{-2}$  m<sup>2</sup>/g is contributed by the surface of the spherical bead. If AMBERLITE™ XAD-4 contained 2.0 mmol/g of pendant vinyl groups, then only 0.00002 mmol/g of vinyl groups (~0.001%) would be available on the surface for any reaction with  $\text{H}_2\text{PtCl}_6$ . This amount is clearly insignificant even if a platinum complex were forming, and Dr. Lundquist found nothing in the literature to suggest that the Pt(IV) based  $\text{H}_2\text{PtCl}_6$  would complex with a styrene like moiety.

Sanders *et al.* clearly does not teach the elements of Applicants composition. Applicants respectfully submit that all of the limitations of a claim must be considered in establishing anticipation under 35 U. S. C. §102(b). Applicants respectfully submits the invention as presented in claims 1, 2 and 4-6 is patentable over Sanders *et al.*

Rejection under 35 U.S.C. § 103(a) over Sanders, et al. (USP 4,348,509)

Claims 1, 2, and 4-6 stand rejected under 35 U.S.C. 103(a) as obvious over Sanders, et al. (USP 4,348,509).

Applicants respectfully submit that, because the particle of Sanders is a particle coated by a metal complex that is not known to pi-bond to olefins, it follows that Sanders does not disclose, teach, or suggest applicants' invention. Furthermore, the average pore size for XAD-4 is so small that it does not efficiently imbibe metal complexes dissolved in solvents having solvent properties very similar to those of XAD-4. Sanders states at column 2, lines 26-35 of USP 4,348,509:

"The preferred resins have... an average pore diameter ranging from about 40 to about 60 angstroms. A typical and preferred resin is that supplied by Rohm & Haas Company and known as AMBERLITE® XAD-4. It has... an average pore diameter of about 50 angstroms."

Clearly, Sanders teaches away from using macroreticular resins having average pore diameters of 100 angstroms or greater. Sanders does not motivate one skilled in the art at the time of the present invention to try, let alone do that invention.

Applicants respectfully submit that all of the limitations of a claim must be considered in establishing a *prima facie* case of obviousness under 35 U. S. C. §103(a). Sanders *et al.* neither discloses teaches or suggests all limitations of Applicants invention. Applicants submits the invention as presented in claims 1, 2 and 4-6 is patentable over Sanders *et al.* of record.

Rejection under 35 U.S.C. § 102(b) over Welborn, Jr. (USP 5191052)

Claims 1, 2, and 4-6 stand rejected under 35 U.S.C. 102(b) as anticipated by Welborn, Jr. (USP 5191052). The Examiner notes that



Welborn, Jr. discloses a process in which a substituted zirconium is used to polymerize butadiene (column 24, lines 11-41). The Examiner asserts that:

“Since a butadiene polymer chain becomes attached to the zirconium during polymerization, the butadiene polymer chain end can be said to be reacted with the zirconium but in any case since the product contains unsaturations from the butadiene, it would also reasonably appear that a portion of the butadiene would be coordinated to the zirconium and that the product would be a zirconium supported on the butadiene polymer especially since there was no attempt to purify the material.”

During an in-person interview on 21 May 2003 including the Examiner and agents for the applicants, Richard R. Clikeman and Stephen E. Johnson, the Examiner proposed that applicants

“amend the claim to recite that the claimed composition is a porous particulate composition such as was not taught by Welborn, Jr..”

Applicants have replaced the term “composition” with the term “porous particulate composition” in claim 1 and, thereby, in claims 2-6 depending therefrom. Applicants assert that, by this amendment, Examiner’s rejection is obviated.

**Rejection under 35 U.S.C. § 103(a) over Welborn, Jr. (USP 5191052)**

Claims 1, 2, and 4-6 stand rejected under 35 U.S.C. 103(a) as obvious over Welborn, Jr. (USP 5191052)).

Relying on the amendment to claim 1 in which applicants have replaced the term “composition” with the term “porous particulate composition”, Applicants assert that Examiner’s rejection under 35 U.S.C. 103(a) is obviated.

Objection to Claim Dependent upon a Rejected Base Claim

Applicants acknowledge Examiners objection to claim 3. In view of amendments to claim 1, Applicants assert the Examiners objection to claim 3 is obviated.

Thus, independent claim 1 as amended and dependent claims 2-6 are patentable over the prior art documents of record.

If the Examiner finds that there are some remaining issues to be resolved, Applicants would appreciate the Examiner to grant them a discussion or another interview pursuant to 37 C. F. R. §1.133, to clarify any remaining issues and to place the Application in better condition for allowance. Please charge any fees associated with this response to Deposit Account No. 18-1850. Applicants invite the Examiner to contact the undersigned to discuss any issues related to this application by telephone.

Respectfully submitted,



Stephen T. Falk  
Registration No. 36,795  
Attorney for Applicants

ROHM AND HAAS COMPANY  
100 Independence Mall West  
Philadelphia, PA 19106-2399  
Telephone : (215) 592-6745  
Facsimile : (215) 592-2682

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